

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 08 MAR 2005

WIPO PCT

Applicant's or agent's file reference <b>BHPB0PPC00132</b>	<b>FOR FURTHER ACTION</b>	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International Application No. <b>PCT/AU2003/001299</b>	International Filing Date (day/month/year) <b>2 October 2003</b>	Priority Date (day/month/year) <b>9 October 2002</b>
International Patent Classification (IPC) or national classification and IPC <b>Int. Cl. <sup>7</sup> E21C 41/26</b>		
Applicant <b>BHP BILLITON INNOVATION PTY LTD et al</b>		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheet(s).

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☒ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand <b>11 March 2004</b>	Date of completion of the report <b>09 February 2005</b>
Name and mailing address of the IPEA/AU <b>AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929</b>	Authorized Officer  <b>BARRY STEPHENS</b> Telephone No. (02) 6283 2106

**I. Basis of the report****1. With regard to the elements of the international application:\***

- ☒ the international application as originally filed.
- ☐ the description, pages , as originally filed,  
pages , filed with the demand,  
pages , received on with the letter of
- ☐ the claims, pages , as originally filed,  
pages , as amended (together with any statement) under Article 19,  
pages , filed with the demand,  
pages , received on with the letter of
- ☐ the drawings, pages , as originally filed,  
pages , filed with the demand,  
pages , received on with the letter of
- ☐ the sequence listing part of the description:  
pages , as originally filed  
pages , filed with the demand  
pages , received on with the letter of

**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:**

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

**4. ☐ The amendments have resulted in the cancellation of:**

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.

**5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\***

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

**IV. Lack of unity of invention****1. In response to the invitation to restrict or pay additional fees the applicant has:**

- ☐ restricted the claims.
- ☐ paid additional fees.
- ☐ paid additional fees under protest.
- ☐ neither restricted nor paid additional fees.

**2. ☒ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.**

**3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is**

- ☐ complied with.
- ☒ not complied with for the following reasons:

Claims 1-9 comprise a method of determining the removal of material from a location including the steps of calculating revenue and determining a schedule with regard to grade constraints. It is considered that this constitutes a first "special technical feature".

Claims 10 is directed to an improvement in a method of determining the removal of material of a differing relative value or value from a location comprising sorting each of the blocks according to its value, listing each block and its associated value in a table and re-sorting the table listing to reduce violations. It is considered that this comprises a second "special technical feature".

Claims 11-16, and 18-23 are directed to a method and system of reducing violations in the removal of material(s) in block(s) of a differing value from a location comprising selecting a block, determining a cone corresponding to the selected block, determining violations attributed to the cone, and determining a new position of the cone with reference to reduced violations (or reduced NPV). It is considered that this comprises a third "special technical feature".

Claim 17 is directed to an improvement in a system for determining removal of material(s) of differing value from a location comprising means for sorting each of the blocks according to its value, means for listing each block and its associated value in a table, irrespective of violation(s), and means for re-sorting the table listing to reduce violations. It is considered that this constitutes a fourth "special technical feature".

(Claim 24 may be appended to either claim 10, or claims 11-16 and 18-23)

Claims 25-34 comprise a method of determining the removal of material(s) from a location including selecting a value of risk, calculating a corresponding return and determining a schedule corresponding to the risk and return. It is considered that this constitutes a fifth "special technical feature".

**4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:**

- ☒ all parts.
- ☐ the parts relating to claims Nos.

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims 5, 6, 10-24, 27-81	YES
	Claims 1-3, 7-9, 25, 26,	NO
Inventive step (IS)	Claims NONE	YES
	Claims 1-81	NO
Industrial applicability (IA)	Claims 1-81	YES
	Claims NONE	NO

**2. Citations and explanations (Rule 70.7)**

Although the claims are in general vague in their wording and of indeterminate scope, (see also Box VIII), making it difficult to give a meaningful opinion regarding their novelty and inventiveness, the general concept of the invention as discussed in the description may be identified as methods and systems for an optimisation of the order in which blocks should be removed from a location in an open pit mine (or similar mining operation). This optimisation involves the use of one or more computer programs, which per se are excludable from a search under rule 39 and hence from any opinion. Also several of the claims comprise mathematical expressions, which similarly is excludable matter under rule 39.

In discussing the prior art, the Applicant admits that attempts have been made to optimise the order of block extraction in open pit mining operations. In fact, this is normal procedure in the industry- see, for example, the respective papers by Brealey & Atkinson, Pana, and Lerch & Grossman cited in the ISR. Moreover, a person skilled in the art, in seeking to optimise the order in which blocks should be removed from a mining location could be expected to refer to more recent published papers on the subject such as those of Bezdek et al, Wharton & Whittle, Underwood & Tolwinski, and Caccetta & Hill that were also cited in the ISR. It would be obvious to the PSA to combine the teachings of any of the two groups of citations, as indeed the Applicant appears to have done.

According it is considered that the invention as claimed either lacks novelty, or lacks an inventive step as follows:

NOVELTY (N): Claims 1-3, 7-9, 25, 26 .

-Brealey & Atkinson

-Pana

-Lerch & Grossman

Each of the cited papers either explicitly discloses the features of the invention as claimed in these claims or they were matters of common general knowledge in the art at the publication date of the citations. For example, considering Brealey & Atkinson, see

- Calculating revenue page 155 Valuation of Deposit
- Determining a schedule page 155 Valuation of Deposit, Economic Cut-off, Fig. 9

[continued in a Supplemental Box]

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claim 1 is indeterminate in scope, consisting of only two very broad and vague steps namely "calculating revenue" and "determining a schedule with regard to grade constraints".

Claims 10 and 17 should be directed to an improvement in a method and a system respectively.

Claim 13 is of indeterminate scope: it is speculative as to what manner the methods of claims 11 and 12 are to be combined.

Claims 35 and 46 are of indeterminate scope in their reference to "a further variable 'v' "

Claim 42 is of indeterminate scope on account of its reference to "a relatively time-ordered way".

Claim 59 is prima facie invalid: material extracted from a mine by the method of claim 58 would be indistinguishable from material extracted by any other method.

Claim 64 is speculative and of indeterminate scope, being directed to a method of determining a schedule for the extraction of clumps comprising merely assigning a " period of time" (corresponding to at least a portion of the clumps) to the portion of clumps. It is not clear what time period is being referred to, nor how this is to relate to determining a schedule for the extraction of clumps.

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

**Continuation of Box IV**

Claims 35-48 comprise a method or apparatus for determining an aggregated block ordering for the extraction of material from a location including the steps of clustering blocks from a block sequence in raw form according to spatial coordinates x, y and /or z and a further variable 'v'. It is considered that this constitutes an sixth "special technical feature".

Claims 49-62 comprise a method (or apparatus) for determining a mine design including determining a plurality of blocks in the mine, aggregating at least a proportion of the blocks, providing a block sequence using an integer program and refining the sequence according to predetermined criteria. It is considered that this constitutes a seventh "special technical feature".

Claims 64-78 are directed to a method of determining a schedule for extraction of clump(s) comprising determining a period of time corresponding to at least a portion of the clump(s) and assigning the period of time to the portion of clumps. It is considered that this represents an eighth "special technical feature".

**As the above groups of claims do not share any of the identified special technical features, a technical relationship as defined in Rule 13 between the independent claims does not exist. Accordingly the application does not relate to a single invention or to a single inventive concept.**

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

**Continuation of Box V****INVENTIVE STEP (IS):** Claims 4-6, 10-24, 27-81

As explained in the preamble above, each of the features of these claims is either explicitly disclosed in one or more of the citations listed, any such combination being obvious to the PSA, or they are matters that per se are excludable from a search under rule 39.1 and hence from any opinion. For example, claims 4, 5, 28, and 29 comprise mathematical expressions for calculating revenue, return, or risk. (Incidentally, the variables  $v$  and  $w$  in claims 28 and 29 are not explicitly defined, presumably because they are well known to the PSA). Also claims 8, 9, 33, 34 and 48 are directed to computer program products that per se are also excludable matter under rule 39.1

Accordingly, the invention as claimed in these claims lacks an inventive step.